

What is claimed is:

1. An arithmetic decoding method of decoding  
arithmetically encoded image data formed of at least  
5 one bitplane, by using  $n$  memories that can be accessed  
separately,

the arithmetic decoding method comprising the  
steps of:

storing, when  $n$ -bit image data is to be decoded,  $n$   
10 variables corresponding to pixels to be decoded, of  
respective  $n$  bitplanes of the  $n$ -bit image data in  
respective corresponding ones of the  $n$  memories;

storing, when less than  $n$ -bit image data is to be  
decoded, one of the variables corresponding to pixels  
15 to be decoded, of each bitplane of the less than  $n$ -bit  
image data, in at least part of the  $n$  memories by  
allocating the one of the variables thereto;

sequentially reading ones of the variables  
corresponding, respectively, to pixels to be decoded,  
20 of each bitplane, from the  $n$  memories; and

sequentially decoding the pixels based on the  
corresponding ones of the variables sequentially read  
from the  $n$  memories.

2. An arithmetic decoding method of decoding  
25 arithmetically encoded image data formed of at least  
one bitplane, by using  $n$  memories that can be accessed  
separately,

the arithmetic decoding method comprising the steps of:

storing, when n-bit image data is to be decoded, n sets of a more probable symbol and a state value or a probability estimate corresponding to pixels to be decoded, of respective n bitplanes of the n-bit image data in respective corresponding ones of the n memories;

storing, when less than n-bit image data is to be decoded, a set of the more probable symbol and the state value or the probability estimate corresponding to pixels to be decoded, of each bitplane of the less than n-bit image data, in at least part of the n memories by allocating the set of the more probable symbol and the state value or the probability estimate thereto;

sequentially reading pairs of the more probable symbol and the state value or the probability estimate corresponding, respectively, to pixels to be decoded, of each bitplane from the n memories; and

sequentially decoding the pixels based on the corresponding pairs of the more probable symbol and the state value or the probability estimate sequentially read from the n memories.

3. An arithmetic decoding method according to claim 2, including the steps of:

reading b pairs of the more probable symbol and

the state value or the probability estimate that can actually correspond to each pixel simultaneously from the  $n$  memories, before which of the  $b$  pairs of the more probable symbol and the state value or the probability estimate actually corresponds to the pixel is known, when the relationship of  $n = m \times b$  ( $m$  is equal to the less than  $n$ , and  $b$  is an integer equal to or larger than 2) holds;

excluding ones of the  $b$  pairs of the more probable symbol and the state value or the probability estimate which are known not to correspond to the pixel; and

carrying out the decoding by selecting and using one of the  $b$  pairs of the more probable symbol and the state value or the probability estimate which is eventually known to actually correspond to the pixel.

4. An arithmetic decoding method according to claim 2, including the step of designating a mode of the decoding corresponding to the number of bits of the image data.

5. An arithmetic decoding method according to claim 2, including the step of generating a context for selecting the one of the  $b$  pairs of the more probable symbol and the state value or the probability estimate, in a manner such that one of components of the context, which is to be determined last, is set to a bit representative of a pixel on a most significant one of the at least one bitplane.

6. An arithmetic decoding device for decoding arithmetically encoded image data formed of at least one bitplane,

the arithmetic decoding device comprising:

5       n memories that can be accessed separately and stores n sets of a more probable symbol and a state value or a probability estimate for decoding pixels of the at least one bitplane;

10       a storage control section that stores, when n-bit image data is to be decoded, the n sets of the more probable symbol and the state value or the probability estimate corresponding to pixels to be decoded, of respective n bitplanes of the n-bit image data in respective corresponding ones of the n memories, and  
15       stores, when less than n-bit image data is to be decoded, a set of the more probable symbol and the state value or the probability estimate corresponding to pixels to be decoded, of each bitplane of the less than n-bit image data, in at least part of the n  
20       memories by allocating the set of the more probable symbol and the state value or the probability estimate thereto;

25       a readout section that sequentially reads pairs of the more probable symbol and the state value or the probability estimate corresponding, respectively, to pixels to be decoded, of each bitplane from the n memories; and

a decoding section that sequentially decodes the pixels based on the corresponding pairs of the more probable symbol and the state value or the probability estimate sequentially read from the  $n$  memories.

- 5        7. An arithmetic decoding device according to claim 6, including a pre-read control section that reads  $b$  pairs of the more probable symbol and the state value or the probability estimate that can actually correspond to each pixel simultaneously from the  $n$  memories, before which of the  $b$  pairs of the more probable symbol and the state value or the probability estimate actually corresponds to the pixel is known, when the relationship of  $n = m \times b$  ( $m$  is equal to the less than  $n$ , and  $b$  is an integer equal to or larger than 2) holds; and
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a selection section that excludes ones of the  $b$  pairs of the more probable symbol and the state value or the probability estimate which are known not to correspond to the pixel; and

- 20        wherein the decoding section carries out the decoding by selecting and using one of the  $b$  pairs of the more probable symbol and the state value or the probability estimate which is eventually known to actually correspond to the pixel.

- 25        8. An arithmetic decoding device according to claim 6, including a decoding mode-designating section that designates a mode of the decoding corresponding to

the number of bits of the image data.

9. An arithmetic decoding device according to claim 6, including a context-generating section that generates a context for selecting the one of the b  
5 pairs of the more probable symbol and the state value or the probability estimate, in a manner such that one of components of the context, which is to be determined last, is set to a bit representative of a pixel on a most significant one of the at least one bitplane.

10 10. A storage medium storing a program for causing a computer to execute an arithmetic decoding method of decoding arithmetically encoded image data formed of at least one bitplane, by n memories that can be accessed separately,

15 the program comprising:

a storage control module that stores, when n-bit image data is to be decoded, n sets of a more probable symbol and a state value or a probability estimate corresponding to pixels to be decoded, of respective n  
20 bitplanes of the n-bit image data in respective corresponding ones of the n memories, and stores, when less than n-bit image data is to be decoded, a set of the more probable symbol and the state value or the probability estimate corresponding to pixels to be  
25 decoded, of each bitplane of the less than n-bit image data, in at least part of the n memories by allocating the set of the more probable symbol and the state value

or the probability estimate thereto;

a readout module that sequentially reads pairs of  
the more probable symbol and the state value or the  
probability estimate corresponding, respectively, to  
5 pixels to be decoded of each bitplane from the n  
memories; and

a decoding module that sequentially decodes the  
pixels based on the corresponding pairs of the more  
probable symbol and the state value or the probability  
10 estimate sequentially read from the n memories.